CLAIMS

What is claimed and desired to be secured by United States Letters Patent is:

1. A method of combusting a liquid primary fuel comprising the steps of

establishing a zone of combusting hydrogen,

injecting a mechanically atomized stream of liquid primary fuel through the zone of combusting hydrogen such that a substantial portion of the liquid primary fuel contacts the hydrogen flame front and hot product gases, and

igniting the vaporized portion of the primary fuel by the hydrogen flame.

2. The method of claim 1 wherein the hydrogen combustion zone is established by the steps of:

flowing a pressurized source of hydrogen at a controlled rate through a plurality of conduits each with a discharge opening into said hydrogen combustion zone,

igniting the hydrogen discharging from the conduits, and

rotating the conduits about an a central axis to simulate a continuous zone of combusting hydrogen.

3. The method of claim 2, further comprising the step of increasing the rotational speed of the conduits until maximum combustion efficiency of the primary fuel is achieved.

4. The method of claim 2 where the source of hydrogen flowing through the plurality of conduits consists of a 2-to-1 molar ratio of hydrogen and oxygen generated from the electrolysis of water.

5. The method of claim 2 wherein said plurality of conduits is two, spaced equidistantly and equicentricly around the central axis of rotation with the axis of each discharge opening angled toward the central axis of rotation.

6. The method of claim 2 wherein the rotation speed of a point center to the discharge of said conduits is at least equal to or greater than the forward flame velocity of the combusting hydrogen.

7. The method of claim 1 wherein said injection of liquid primary fuel further comprises the step of flowing a pressurized source of liquid primary fuel at a controlled rate through a plurality of conduits rotating about a central axis with the discharge end of each conduit fitted with a liquid atomizing nozzle which discharges the primary fuel into the zone of combusting hydrogen.

8. The method of claim 7 where a single liquid primary fuel conduit is used that transports the primary fuel along the axis of rotation.

9. The method of claim 1 where said primary fuel is taken from the group consisting of: 1) processed and unprocessed vegetable oils, 2) by-product oils from agricultural products processing, 3) liquid or liquefied petroleum fuels, or 4) liquid or liquefied animal fats.

10. The method of claim 2 where the steps of flowing the hydrogen from the hydrogen source to the combustion zone are further comprised of:

    generating a constant rate of hydrogen and oxygen gases from the electrolysis of water by regulating the electrical current input to the electrolysis cell, and

    transferring the hydrogen and oxygen gases into a fixed-volume staging chamber formed around the central axis of rotation such that the gases are continuously exposed to the inlet openings of the rotating conduits.

11. The method of claim 1 wherein an additional step of injecting a controlled rate of water or steam into the zone of combusting hydrogen is used to control the formation of oxides of nitrogen.

12. The method of claim 11 where the injection of water is accomplished by pre-mixing the water at a controlled rate with the liquid primary fuel.

13. A burner for combusting a liquid primary fuel and hydrogen comprising:

an electrical motor,

a rigid circular shaft with a proximal end connected to the electrical motor and a distal end connected to a burner tip,

a pair of circular hydrogen transport tubes formed inside the shaft, each tube having an inlet channel running perpendicular to the central axis of the shaft with an opening on the outer surface of the shaft for receiving the hydrogen and a shaft channel running generally parallel to central axis of the shaft for transporting the hydrogen from the inlet channel to the burner tip flange,

a primary fuel tube formed inside the shaft, such tube having an inlet channel running perpendicular to the central axis of the shaft with each end of the inlet channel opening on the outer surface of the shaft for receiving the liquid primary fuel, and shaft channel running along the central axis of the shaft for transporting the primary fuel from the inlet channel to the burner tip flange,

a coolant chamber formed around the shaft closest to the distal end for containing a circulating coolant fluid,

a hydroxy chamber containing a pressurized hydrogen gas source that is located adjacent to the proximal side of the coolant chamber and is formed around the shaft where the openings of the hydrogen transport tubes perpendicular to the shaft's central axis project, and

a primary fuel chamber containing a pressurized primary liquid fuel that is located proximal to said second chamber and that is formed around said rigid shaft where the openings of the primary fuel tubes perpendicular to the shaft's central axis project.

14. The burner of claim 13 that further comprises a plurality of mechanical seals located between each of the chambers to allow the shaft to freely rotate while containing the contents of the chambers.

15. The burner of claim 13 that further comprises a forward bearing attached to the shaft near the tip end of the burner and a rear bearing attached to the shaft near the connection to the electrical motor.

16. The burner of claim 13 where the shaft channel section of the hydrogen transport tubes extends away from the central axis of the shaft at an angle from 10 to 30 degrees relative to the central axis of the shaft.

17. The burner claim 13 wherein the burner tip is comprised of:

a solid circular flange having a proximal face attached the end of the shaft, a distal face open to the combustion zone, a hole for passing the liquid primary fuel from the shaft and a pair of holes for passing the hydrogen from the shaft,

a pair of hydrogen discharge tubes inserted into the hydrogen holes that project away from the distal face of the flange a first distance at the same angle relative to the central axis of rotation as the hydrogen transport tubes, and second distance at an angle which intersects the central axis of said rigid shaft, and

a liquid dispersing nozzle inserted into the primary fuel hole for discharging the primary fuel into the combustion zone.

18. The burner tip of claim 17 where said first and second distances are between 0.5 and 3 inches and said second distance angle is between 22 and 60 degrees relative to the centerline of said hydrogen transport tubes.

19. The burner of claim 13 further including an electrolytic cell for generating hydrogen and oxygen gases connected to the hydroxy chamber, where the rate of hydrogen being fed to the

burner is controlled by varying the surface area of the electrolytic plates in the cell and current input to the electrolytic cell.

20. The burner of claim 13 further including a fourth chamber around the shaft for staging a secondary liquid or gaseous material to be injected into the combustion zone, with the shaft including additional transport tubes located therein for transporting the secondary material either into the primary fuel transport tube or separately toward the burner tip.